



AUGUST SOLAR LINE-UP

Mariner IV Refuses to Give Up; Gets Radiation Measuring Job

Over two years after its historic flight past Mars, Mariner IV is still operating well and has been assigned a new mission by NASA.

In August, a solar system line-up will occur, involving the Sun, earth and two spacecraft. Scientists hope to measure radiation from locations in space at three widely separated points, in a straight line out from the Sun.

Mariner V, launched June 14, will be at a point between the Venus and earth orbits on its trajectory to Venus where it will approach within 2,500 miles of the planet October 19. At the same time, Mariner IV will be in line with its sister spacecraft, earth and the Sun, at a point between the Earth and Mars orbits.

Compare Notes

Simultaneous comparisons of Sun radiation, received by the earth and the two spacecraft spaced millions of miles apart, will be made during this alignment.

Mariner IV has come a long way to perform its second mission. Now in its 966th day of flight, the spacecraft has traveled 1.3 billion miles from Cape Kennedy, Fla., where it was launched November 28, 1964.

By October, 1965, Mariner IV's transmissions of data were out of reach of the 85-foot antennas of the world-wide Deep Space Network which had tracked this spacecraft on a 24-hour basis for nearly a year and had received the historic television pictures that revealed the existence of Martian craters.

Mariner IV had widened its communications distance from 135 million miles on July 14, 1965, at Mars to more than 190 million miles October 1, 1965. The earth also in motion around the Sun had left the beam of the spacecraft's high gain antenna. It had become impossible to receive telemetry across such a distance.

Big Dish Makes Contact

Then, early in 1966, NASA and the Jet Propulsion Laboratory established a new radio link with Mariner IV. A huge new ground antenna 210 feet in diameter was completed at the Deep

Ants Please Note: Picnic Switched

The date of the fifth annual MSC Picnic, originally scheduled for October 1, has been switched to Saturday, October 14. The picnic committee has issued a call for help to work on all the thankless chores of getting such a function off the ground.

To volunteer, call picnic committee chairman Betty Schick at 3371 or cochairman Rita Sommer at 2397. 'Tis fun, they say.

Space Network's Goldstone station.

Coupled with a supersensitive receiver, the big dish pulled in Mariner's signal from 216 million miles and once again the spacecraft was reporting on the interplanetary space environment and its own operating condition.

In March, 1966, Mariner IV signals were transmitted from the spacecraft to earth through the solar corona while the earth

July ISA Meet Hears UofT Prof

Dr. Fred B. Vogt, chairman of the University of Texas Department of Biomedical Engineering will be the featured speaker at the July 27 meeting of the Apollo Section of the Instrument Society of America. Dr. Vogt's topic will be "Effects of Space on the Human System."

Dr. Vogt's dual background of electrical engineer and medical doctor qualifies him to discuss the aspects of the engineer's approach to medicine — the human system and its interface with mechanical systems and effects of space environment on the human system. He will also review the current status of biomedical instrumentation.

The ISA meeting will be at the Holiday Inn on NASA Road 1, and non-members are invited to attend. Cocktails are at 6:15 pm, dinner (\$3.50/person) at 7:15 and meeting at 8.

For reservations call HU 8-1270 Ext 397, or HU 8-0900.

and the spacecraft were on opposite sides of the Sun.

For more than a year, the orbits of the Mariner IV and earth have been closing. Today, the communications distance is less than 50 million miles. During the first week of September, the spacecraft will pass within 30 million miles of earth.

Earlier, during its originally assigned mission on July 14, 1965, Mariner IV flew within 6,118 miles of Mars, took 22 photographs and gathered other scientific data for transmission back to earth.

The missions of Mariners IV and V are controlled by the combined Mariner Operations Team at JPL in Pasadena, Calif.

Exceeds Expected Life

Having operated continuously for more than 23,000 hours, Mariner IV has exceeded its 6,000 hour design life by nearly 400 per cent.

Recent data from the spacecraft indicate that one of its two radio amplifiers may have failed. But the spacecraft automatically switches to backup units in the event of such failure and is still communicating.

(Continued on page 3)

Inside . . .

Graduate degrees are earned by 16 at MSC, page 2. Five employees receive fellowships, on page 3. What it is like on the new Apollo tracking ships, on pages 4 and 5.

Well Done and Farewell



IN APPRECIATION—MSC Director of Flight Operations Christopher C. Kraft, Jr. hands an appreciation plaque to USAF Gen. Leighton I. Davis, who for the past seven years was USAF National Range Division Commander and DOD Manager for Manned Space Flight Support Operations. General Davis has been assigned as commandant of the Industrial College of the Armed Forces, Fort Leslie J. McNair, Washington, D.C. The plaque, with an etched drawing of the DOD console in Mission Control Center from where he directed DOD support of manned missions, was presented to the general at a dinner party July 15 at the Nassau Bay Hotel attended by some 50 MSC management, flight operations and flight crew people and their wives.

Surveyor IV Goes Dead After Ideal Trajectory

After a flawless launch and a translunar injection that required only a small midcourse maneuver to place the spacecraft precisely on target, the fourth in the Surveyor soft-landing lunar spacecraft apparently impacted on the moon when some yet unidentified malfunction occurred during the retrofire and landing sequence.

Surveyor IV lifted off Kentucky Space Center Launch Complex 36 at 6:53 am CDT July 14 and was scheduled to soft land in the exact center of the moon's visible face—in Sinus Medii—at 9:30 pm CDT July 16 after a 63-hour 224,730-mile

flight. Project flight controllers at Jet Propulsion Laboratory were unable to get a response from Surveyor at the time of predicted landing or on the following morning.

A committee has been formed to investigate the probable cause of the failure.

Surveyor IV was similar in most respects to its three predecessors and had as a primary mission the relaying back to earth television pictures of the lunar surface in one of the so-called Apollo landing sites near the lunar equator.

In addition, Surveyor IV was equipped with instrumentation to measure any magnetic material on the lunar surface, and also was to have provided data on the radar reflectivity and mechanical properties of the surface.

One earlier Surveyor, Surveyor II, failed in its mission when a vernier engine failed to ignite during a midcourse correction maneuver.

Langley 50-Year Special Edition Available at P10

Copies of the Newport News, Va., *Daily Press*' special Langley Research Center Fiftieth Anniversary edition are available at the MSC Public Information Office in Nassau Bay Bldg 6.

Since a limited number of the special editions are available, it is requested that only those MSC employees pick up copies who were with NACA at Langley before NASA was formed, or who subsequently transferred to MSC from Langley. They are also available for telephone request at Ext 5111.

Icelandic Saga



GRUNT SQUAD—Geology field trips are not always beer and skittles for MSC pilots. Here, a group of pilots dig their heels into Iceland's snow to help their bus—seemingly in reverse gear—get over a hummock. The trek through Icelandic hinterland included fording fjords, baking wet boots on stoves at night and sleeping on and under tables in sleeping bags while wishing one were back in good old Reykjavik.

Sixteen Complete Graduate Study, Receive Degrees

In June four MSC employees received their PhD degrees and 12 received their Masters Degree through participation (totally or in part) in the MSC Graduate Study Program. One employee was awarded the associate of Arts degree through his academic assignments in the apprentice program.

Dr. John Dornbach, Chief of the Mapping Sciences Branch of the Lunar and Earth Sciences Division received his PhD in Geography from Clark University. The title of his dissertation was "An Analysis of the Map as an Information System Display."

Dornbach's dissertation concludes that contrary to most cartographic and geographic practices of today, the map need not, in fact, should not be as difficult to comprehend as a foreign language, and that the cartographer is mostly responsible for adhering to standards and conventions which perpetuate the concept that maps can be useful only after their language has been learned and understood. It represents an approach and an example from cartographic practice which indicates the value of the human factors or information presentation concept.

Dornbach entered the government service in 1952 as a cartographer with the Department of the Air Force. From 1952 to 1961 he received increasingly responsible assignments in the Air Force's Aeronautical Chart and Information Center in St. Louis, Mo. In 1961 he joined the Flight Operations Division of the NASA-Space Task Group as an aerospace technologist in lunar and planetary studies.

Since coming to MSC, Dornbach has devoted his efforts to the complicated field of Lunar Mapping in Flight Operations, later in Engineering and Development and now in the Science and Applications Directorate. He has published articles in "Survey and Mapping", "The Professional Geog-

rapher", "Science Digest" and "The Journal of the Institute of Navigation". He has also spoken to numerous groups interested in the field of aerospace mapping.

Dornbach is the MSC representative to the Joint Office of Manned Space Flight-Office of Space Science and Applications Data Analysis Committee. During his MSC service Dornbach has received a Sustained Superior Performance Award and an Outstanding Performance Award.

Prior to beginning his career in the Federal service, Dornbach was a teaching assistant at Washington University in St. Louis where he received his MA degree in geography and later a Fellow at Clark University while pursuing his PhD. He received a BA in geography and a BS in education with a major in chemistry from Southern Illinois University. He has been associated with many professional organizations including the American Meteorological Society (past secretary-treasurer of the St. Louis Chapter), the Association of American Geographers, Sigma Xi and the American Society of Photogrammetry.

Dornbach served as a Marine Corps fighter pilot during World War II.

Dr. Robert C. Ried, Jr., an aerospace engineer in the Aero-Thermal Dynamics Section of the Structures and Mechanics Division, received his PhD in Mechanical Engineering from Rice University. He joined the NASA-Space Group as an aerospace technologist at Langley Field, Virginia immediately after graduation from Massachusetts Institute of Technology with a BSME in 1961. While at MIT he received a MIT scholarship, the MIT Design Award, and was secretary of the Student Chapter of the American Society of Mechanical Engineers. He is also a member of Pi Tau Sigma.

Ried moved from Langley to Houston with MSC as a member of the Spacecraft Technology

Division. He had begun advanced study in Mechanical Engineering at Virginia Polytechnic Institute and continued at Rice University after his arrival in Houston.

The title of Ried's dissertation was "Equations of Change for a Photon Gas and Their Correspondence with Maxwell's Equations". Briefly, the study involved the following key points: The transport of energy and momentum by thermal radiation is formulated on the basis of a photon gas and on the basis of transverse electromagnetic waves. These independent formulations are both classical and statistical. The two formulations are shown to be quite complementary. The vector characteristics of photon momentum are retained and an analogy is drawn with the statistical approach to molecular gas dynamics. The concept of an electromagnetic phase space is introduced to provide a means for statistical consideration of electromagnetic waves.

Ried's primary assignment both in the Advanced Spacecraft Technology Division and in his present position in Structures and Mechanics Division has been in the field of aerothermodynamics. Ried has authored several technical documents on the subject and has made technical presentations concerning thermal heating.

Dr. C. Howard Robins, Jr., until recently an aerospace engineer with the Experiments and Systems Integration Office of the Applications Project Office, received his PhD degree in physics from Virginia Polytechnic Institute. Robins has transferred to Langley Research Center to continue in his field of aerospace research.

The title of his dissertation was "A Digital Computer Technique for Qualitative Analysis of Complex Samples from their Neutron Induced Gamma Ray Activities". The dissertation describes a new digital computer technique for determination of the elemental constituents of an un-

known specimen from a set of time dependent gamma ray spectra measured subsequent to neutron activation of the specimen. The technique utilizes a new approach to spectrum stripping which permits the analysis of samples of much greater complexity than is possible with existing computer procedure.

Robins entered the government service as a student-trainee in the Coop Program with the National Advisory Committee for Aeronautics, Langley Field, Virginia in 1953. He graduated from Virginia Polytechnic Institute with a BS in aeronautical engineering in 1958 and continued his career as an Aeronautical Research Engineer at Langley. While an undergraduate at VPI, Robins presented papers at two regional student conferences of the I. A. S. of which he was a member. He was also a member of Tau Beta Pi, Sigma Gamma Tau, and Kappa Theta Epsilon. From 1958 to 1961 Robins worked with the Scout Research Vehicle at the Langley Aeronautical Laboratory. In 1961 he joined the NASA-Space Task Group and came to Houston with the establishment of MSC. From 1961 to 1965 Robins worked with the Advanced Spacecraft Technology Division, and in 1965 transferred to his present assignment. His primary responsibilities at MSC have been associated with spacecraft integration studies.

Robins began his graduate study through the Virginia Polytechnic Institute soon after graduation in 1958. After moving to Houston he returned to VPI under MSC Full-time Graduate Study Program. By combining research acceptable to the University with his job responsibilities, Robins completed his dissertation requirements.

Dr. Jerry L. Modisette, Chief, Physics Division, earned his PhD degree in Space Sciences at Rice University in June. The title of his dissertation was "Angular Momentum Effects of Solar and Stellar Winds". Modisette calculated the rotation of the sun, and researched the influence of magnetic forces on the solar body. He found that it is possible that magnetic forces slow the rotation of the sun. His research is published in the Journal of Geophysical Research.

Modisette was first employed by the Government in 1956 as a mathematician with the Langley Aeronautical Laboratory of the National Advisory Committee for Aeronautics. He worked both as a mathematician and an engineer in research assignments at Langley from 1956 to 1962 when he joined MSC.

Modisette received a BS in mathematics from Louisiana Polytechnic Institute, and while employed at Langley, his MS in physics from Virginia Polytechnic Institute in 1960.

Modisette's chief interest for the past several years has been

in space radiation and fields. In addition to authoring several papers on environment studies, Modisette is considered a "space weather" expert, and has served as an advisor to other organizations in the space environment field.

The following employees received master's degrees in August 1966: Wallace Stewart, Computation and Analysis Division, a MS in mathematics from Texas A & M University; Jesse Jones, Propulsion and Power Division, a MS in Mechanical Engineering from the University of Houston; W. E. Simon, Propulsion and Power Division, a MS in Mechanical Engineering from the University of Houston; William Bradley, Advanced Spacecraft Technology Division, a MS in Mechanical Engineering for the University of Houston and; Ben Holder, Structures and Mechanics Division, a MS in Aeronautical Engineering from the University of California at Los Angeles.

Ronald Harron, Crew Systems Division, received his MS in Industrial Engineering from the University of Houston in June.

Five employees at RASPO-Bethpage, New York, completed the requirements for the MS degree during 1966-67. Three RASPO-Bethpage engineers completed requirements for and were awarded the MS degree in Management Engineering from the C. W. Post College of Long Island University in January. These employees are Walter Gaylor, Henry Gawrylowitz, and Robert Zuckerman. Robert Newlander, RASPO-Bethpage engineer, was awarded the MS degree in Management Engineering from C. W. Post in June, and Fred Zito also an engineer at Bethpage earned his MS Degree in Management Engineering from Brooklyn Polytechnic Institute in June.

L. T. Walker, Information Systems Division, earned a MA degree in history from the University of Houston in June. Walker's graduate work was a personal educational development program, and most courses leading to his degree were not sponsored by the Center.

Max Barnett, an apprentice in the MSC Apprentice Program was awarded the Associate of Arts degree from San Jacinto Junior College. Barnett completed most of the course work through the required Apprentice Program curriculum.

These degree recipients represent the educational benefits offered by MSC. Much of the course work and research that lead to the advanced degrees was sponsored through the MSC Graduate Study Program. The program encourages (as do all the Employee Development programs) continuing study to maintain and/or improve job performance. Information about the MSC Graduate and Undergraduate programs is available from the Employee Development Branch, ext. 7311.



Aerospace Wordsmiths



SUMMER WRITERS—Nine graduate students are at MSC this summer in the Aerospace Analysis and Writing Program to gain training in the organization of scientific research and development of reports from basic data while at the same time providing MSC and the scientific community with additional published information. Each participant receives guidance and technical assistance from MSC scientists and engineers and from the MSC Technical Library.

Rated Superior

Fellowship Awarded to Five at MSC

Five MSC employees have been awarded fellowships through various programs for the 1967-68 school year. R. Bryan Erb and Calvin H. Perrine were awarded MIT-Sloan Fellowships (previously announced in the April 14 issue of the *Roundup*); R. Wayne Young received a Stanford-Sloan Award; Jack G. Cairl was selected as a National Institute of Public Affairs recipient, and, William J. Rhine will attend the Industrial College of the Armed Forces Fellowship Program.

and Navigation Subsystems Manager in the Apollo Spacecraft Program Office. Subsequently, he was the G and N Project Officer and is now the Lunar Module Project Officer. Young received his BS-EE from Texas A&M in 1956, and his MS-EE from Ohio State University in 1957. He served with the USAF Systems Command and worked with General Dynamics prior to joining MSC.

The Stanford-Sloan Program seeks to provide the opportunity for practical operating business executives and future educational leaders to study together and share experiences under the guidance and inspirational leadership of outstanding professors.

The Program attempts to provide an opportunity for participants to develop a better understanding of the economic, social, and political environment of business; a top-management perspective, an aptitude for considering problems from the viewpoint of the entire company; managerial skills and techniques and a breadth of vision beyond the scope of the executive's own area of activity; and increased competence in particular areas of specialization through individual research and extensively directed reading assignments.

A key aspect of achieving these objectives is individual study and development tailored to each participant's specific needs. Stanford-Sloan Fellows are enrolled in the Stanford Graduate School of Business during the nine month duration of the Program.

Jack G. Cairl will represent the Center in the 1967-68 National Institute of Public Affairs. Cairl is currently the Executive Officer of the Medical Research and Operations Directorate. He joined MSC in July 1961 as a personnel management specialist in the Personnel Division. He was employed in this capacity, and later as Chief, Personnel Management Branch prior to assuming his present position in March 1966. Cairl had previously worked in the Industrial Relations Department for the US Navy at Great Lakes from 1958 to 1961, and is a graduate of Michigan State University (BA 1956 and MA 1960).

The National Institute of Public Affairs Fellowships are awarded to 65 young men and women each year. Recipients are chosen from national competition among Federal and state government employees. The prime emphasis during the year's graduate study is public policy and the management of public programs.

R. Bryan Erb will spend the next 12 months participating in the MIT-Sloan Program. Erb is currently assistant chief of the Structures and Mechanics Division. He began his career in government in May 1959 with the Space Task Group at Langley Research Center as an Aerospace Engineer. Erb had held engineering positions with AVRO Aircraft Limited and Structural Engineering Services prior to joining NASA. He is a graduate of the University of Alberta (BS-1952 and MS-1955) and the College of Aeronautics, U.K.

Calvin H. Perrine, also a MIT-Sloan awardee, joined MSC in February 1962 in the Apollo Spacecraft Program Office as an Aerospace Technologist. Perrine is presently Chief, Mission Planning Branch of the Mission Operations Division. He was a design engineer with the Martin Company prior to coming to MSC. He received his BS in Aeronautical Engineering in 1953 and his MS-AE in 1955, both from Princeton University.

The MIT-Sloan Program is designed to provide quality management development for exceptionally able young men to accelerate their development into positions of major executive responsibilities in the future. The program is an intensive twelve months of study in the latest management techniques and philosophy. A number of field trips are provided to review management policies and practices in government and industry, both in the United States and abroad. Participants also attend formal classroom discussion and instructional seminars on the MIT campus, and are provided the opportunity for research. Through the skillful integration of these educational devices, participants are provided stimulus to develop to a high degree their executive and managerial abilities.

R. Wayne Young, who will attend the 1967-68 Stanford-Sloan Fellowship Program came to MSC in 1962 as the Guidance

The awards, made under a Ford Foundation grant, permit winners to participate in special study programs at one of eight universities—Cornell, Harvard, Indiana, Princeton, Stanford, University of Southern California, Virginia, and Washington. Cairl will attend Cornell.

In summing up the purpose of the awards, Carl F. Stover, President of NIPA said, "These awards are an investment in the Nation's future and democracy's success. We ask any government to do many things in this complex and rapidly changing world. If they are to be done well, its leaders must be exceptional men, qualified for their weighty duties by high orders of intelligence, knowledge, skill, character, and dedication to the public good. These are the qualities the Awards recognize and the year of study will further cultivate."

The National Institute of Public Affairs is a non-profit educational organization dedicated to improving the quality of public service and the ideas and information used in developing public policy.

William J. Rhine, Manager, Apollo Guidance and Navigation Project Office, in the Guidance and Control Division, will attend the 1967-68 Industrial College of the Armed Forces Program. Rhine was first employed at MSC as an Aerospace Engineer in the Apollo Spacecraft Program Office in 1962. He was Manager of RASPO-MIT before returning to Houston in his present capacity in 1965. Rhine worked for General Dynamics and Hughes Aircraft Co. for several

years prior to coming to MSC. He is a graduate of UCLA (BS 1954).

The 10-month Resident Course of the Industrial College of the Armed Forces which Rhine will attend is the heart of the College's program and the basis of its extension programs. While ranging over the field of security affairs generally, the course is sharply focused on the problems and processes of defense management. The fundamental educational goal of the College is to assist the student in increasing his substantive and theoretical knowledge, and technical and human skills, in order to enhance his effectiveness immediately after graduation as well as in the future.

The course of study includes seminars (two to 10 weeks) in management and security subjects and parallel semester length courses in economics, scientific decision-making and executive action, and additional elective courses. Short foundation and skill-development courses are also offered. The faculty is composed of military officers and professional educators in such fields as management, economics, and political science. Rhine is one of 33 civilians selected from national competition among Federal agencies.

Competition for these awards is extremely strong and qualification requirements are rigid. The programs, all designed to develop executive managerial skills and philosophy, represent a part of MSC's long-range employee development effort. These and other educational programs are a significant part of the development and maintenance of a quality staff at MSC.

Orbiters Sub for Apollo In Tracking Practice

Contributions of Lunar Orbiter spacecraft to the Apollo have only begun when they have completed their picture taking and their cameras are turned off.

Three of these vehicles, Lunar Orbiters II, III and IV, continue to circle the Moon, filling an important role as "stand-ins" for the Apollo spacecraft which will one day orbit the moon with its three-man crew.

The Orbiters serve as moving targets in space for equipment and engineers of the Apollo tracking network which will eventually communicate with Apollo crews circling the moon.

NASA's Manned Space Flight Network has been rebuilt and refurbished to support the Apollo program. Its stations and technicians are already undergoing practice exercises to familiarize them with their new responsibilities.

In a typical test, a tracking station trains its antenna on earth's horizon shortly after dark. The moon rises, an Orbiter emerges at the lunar limb from the moon's dark side. The track-

ing station on earth homes in electronically on the spacecraft beacon transmitter as the Orbiter simulates an orbiting Apollo spacecraft.

Mariner IV

(Continued from page 1)

Sun Lock-on

A slight loss in the power output of Mariner IV's solar panels have been observed since an intense solar storm in September, 1966, but they remain the vehicle's primary power source. The spacecraft has maintained its lock on the Sun continuously since shortly after the mid-course maneuver, December 5, 1964.

Mariner IV's future is dependent on its supply of nitrogen gas for its attitude control system. To acquire power for the radio and other electronic equipment, the attitude control system must keep the solar panels pointing toward the Sun. Mariner telemetry indicates the gas supply will last until early in 1968.



Rita A. Love
RASPO-Bethpage
Superior Performance Award

Facility Support Negotiated With Graham, LTV

Graham Corporation of Houston and LTV Range System Division of Dallas have been selected by NASA for competitive negotiation of a contract to provide facility support services at MSC.

A one-year cost-plus-award-fee type contract will be negotiated with provisions for four additional one-year renewals. Estimated cost for the first year beginning December 1 is more than \$10 million.

Services under this contract will include building and ground maintenance, maintenance and operation of utilities, and equipment and associated engineering work related to MSC's plant facilities.

Nine firms responded to request for proposals issued by the Center.

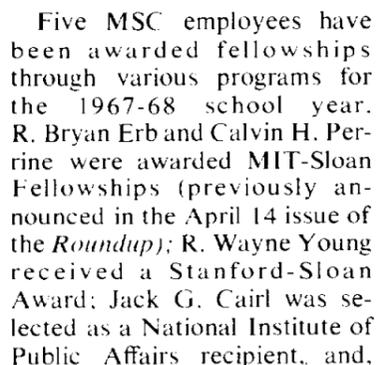
Golfer Group Plans Match-Play For Next Month

The MSC Golf Association July 8 completed its seventh monthly tournament at Ellington AFB. The eighth tournament will be held at El Dorado and Panorama for Groups A and B respectively on July 29. The new tournament point standings are as follows: (First five only)

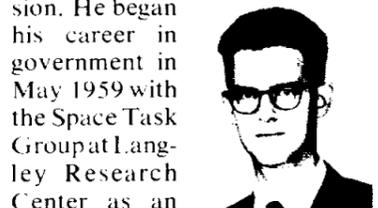
Championship Flight: Dana Boatman-178, Max Engert-153, Cy Biggers-122, Mitch Secundo-122, Tom Hickey-103. *1st Flight:* Norm Cooper-142, Bob Reaves-140, Lorrin Remmick-138, Bob Kosinski-115, Ed Barker-112. *2nd Flight:* Lou Leopold-138, John E. Jones-105, Ed Cawley-105, John McWhorter-101, C. R. Davis-87. *3rd Flight:* Jim Neal-114, Sparky Sparkman-99, John Conlon-97, Carey Lively-85, Earl Patterson-78.

The individual match-play, double elimination competition is scheduled to start approximately August 15. Thirty-five players have signed up to date. Any MSCGA members who have been on leave and have missed the announcement for this competition should call Ray Holloday at 2501.

Jim Neal has been appointed to the MSCGA Executive Committee to fill out the unexpired term of Dave Brown.



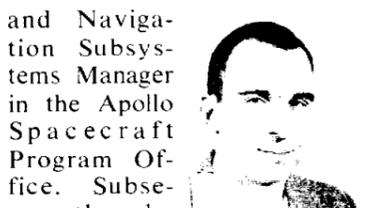
R. Bryan Erb



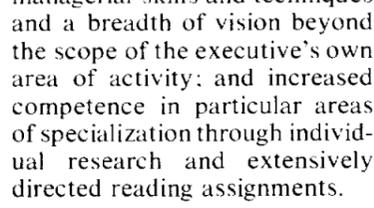
Calvin H. Perrine



R. Wayne Young



Jack G. Cairl



William J. Rhine



Jack G. Cairl



Apollo Mission Control Center aboard the USNS Vanguard.

Network gaps filled by Apollo ships

By Milton Reim

Sometimes referred to as a gap-filler, the *Vanguard* instrumentation ship will join the Manned Space Flight Network (MSFN) and support the requirements of Project Apollo beginning with the first Saturn V mission later this year.

The *Vanguard* is the first of five instrumentation ships scheduled to join the MSFN. Apollo Instrumentation Ships (AIS) for earth orbital insertion and translunar injection in addition to the *Vanguard* will be the *Mercury* and the *Redstone*, plus two instrumentation ships for the reentry phase of the Apollo mission. The latter two ships are the *Watertown* and the *Huntsville*.

Filling gaps is exactly what these ships will be doing in the Atlantic and Pacific Oceans as they provide the MSFN with the capability for mission measurements which are beyond the capabilities of the land-based stations.

The *Vanguard*, along with the other Apollo ships, will have an instrumentation complex which is capable of target acquisition, tracking, communication, command and control, and telemetry reception. Data consumption capabilities of the ships will include trajectories which are: ballistic, near-earth orbital, translunar injection, final trans-earth, reentry, and near-earth rendezvous.

First Job Near

Support for the first Apollo Saturn V mission will be supplied by the *Vanguard* from a position 31.5° N Lat and 45° W Long, or midway between Bermuda and the Canary Islands. Their position will provide coverage for the orbital insertion and the simulated lunar injection phase of the mission on the third revolution.

The *Vanguard* and her two sister ships, the *Mercury* and the *Redstone*, are twice the size of their counterparts — *Coastal Sentry Quebec* and *Rose Knot Victor*—utilized so successfully

during the Mercury and Gemini programs. The Apollo ships *Vanguard*, *Mercury* and *Redstone* are nearly 600 feet in length and have a full load displacement of 23,310 tons. Their maximum on-station endurance is in excess of 100 days with a maximum range of 20,000 nautical miles and their speed varies from a tracking speed of 13 knots to a flank speed of 17 knots. These three 19-Class ships each will be manned by 17 officers, 71 crewmen and about 100 technical people including MSC flight controllers during mission periods.

The two reentry ships, the *Watertown* and the *Huntsville*, are in the 6-Class of ships and are just over 455 feet in length. Their full load displacement is 12,199 tons and they have a range in excess of 10,000 nautical miles with speeds comparable to the 19-Class ships. These two ships will each have a complement of 14 officers, 56 crewmen and about 70 technical people.

Both classes of ships have been modified from non-commissioned US naval ships. The 19-Class modification consists of joining a T-2 tanker bow and stern sections to a new, larger mid-section to permit adequate space for instrumentation systems, support equipment, storage and quarters.

The 6-Class ships are former Victory ships and their structural modifications were less severe to provide the necessary space for their conversion to an instrumentation ship for the reentry phase of the Apollo moon flight.

Comfortable Home Afloat

Aboard the ships, provisions have been made for officers' quarters, crew's quarters, and adequate, comfortable staterooms for technicians and flight controllers. Standard marine safety rules, procedures and life saving equipment will be provided and utilized on all the ships.

Both conventional and sophisticated navigation systems aboard provide for accurately pin-pointing the ship's position.

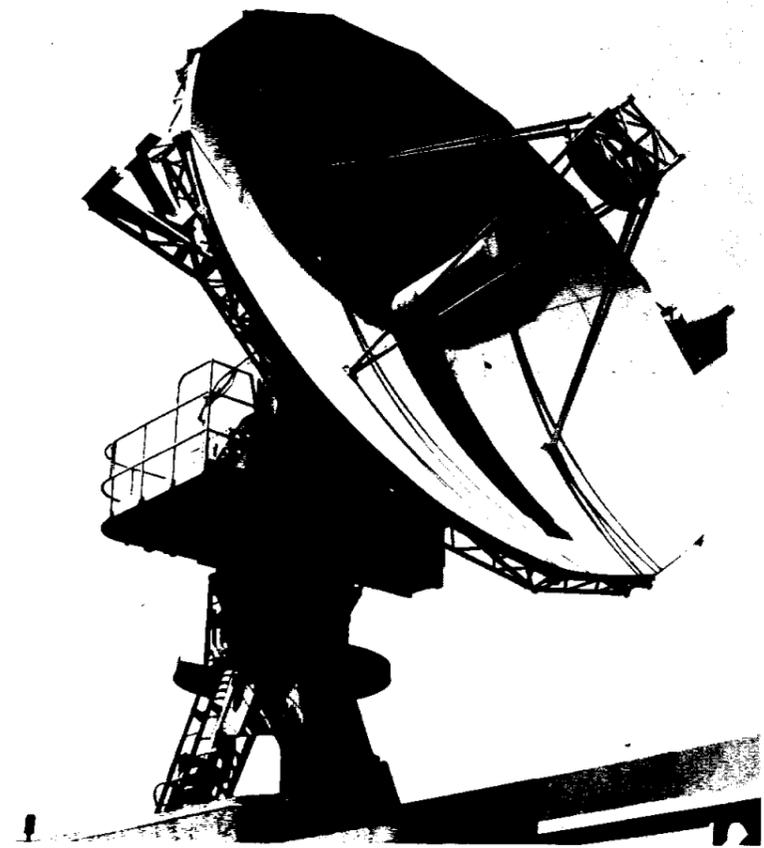
Sea duty periods of up to 60 days are programmed and the ships have provisions for emergency underway replenishment of fuel, foodstuffs, and other supplies.

Crew comforts include air conditioning in all manned and instrumented places, as the ships will be operating in and be on station in the warm regions of the oceans.

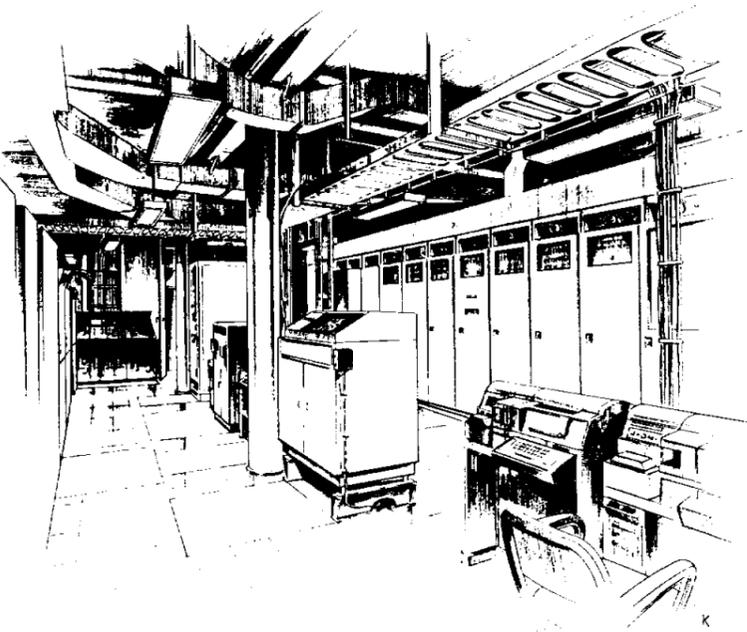
Just about all the comforts of home are provided onboard the ships—even color television—when the ship is near enough to land to pick up the signals. The living quarters include all the normal hotel facilities for crew comfort and convenience. The staterooms contain two berths with bureaus, chairs, wardrobes, bookracks and complete semi-private lavatory facilities. Facilities also provided include lounges, messroom, ship's store, physical training room, laundry, a barber shop, technical library, various types of entertainment such as movies, radios in the staterooms, tables and chairs for card games, magazines and TV. An above-average sea-going medical facility is also to be found on board, however no dental facilities are assigned to the ships.

The marine crews will be from the Military Sea Transport Service while Federal Electric will supply the contractor engineers and technicians. Responsibility for control of the ships rests with the Western Test Range. When not supporting Project Apollo, the ships will be assigned to other space programs requiring data acquisition not supported by land-based stations.

The flight of Apollo spacecraft from liftoff to insertion into an earth orbit will be programmed to a launch azimuth which will vary as a function of



Vanguard's Unified S-Band Antenna.



Sketch of typical tracking ship Central Data Processing Room.

launch delay from the start of the launch window. This fan of possible launch trajectories will be monitored by the Bermuda station in the north and the Antigua station in the south. The gap in the middle will be filled by an instrumentation ship to provide optimum data coverage.

Cover Lunar Returns

The Apollo translunar injection may take place over the Atlantic, Indian, or Pacific Oceans, so the Apollo network data coverage must be supplemented by two instrumentation ships. In the Pacific, two ships will be assigned to cover the reentry area because the ships are not fast enough to cover all possible reentry areas. One will be in the southern hemisphere and one in the northern hemisphere. The declination of the moon will determine in which hemisphere a returning Apollo will land.

The instrumentation complex on the Apollo ships functions as a single system during a mission. For a particular Apollo mission, the projected trajectory is received by the Communication System from Goddard Space Flight Center, fed into the Central Data Processing System, and used to direct the antennas of the Tracking Radar System, the Unified S-Band System, and the Telemetry System for initial acquisition of the spacecraft.

The computer then directs the antennas, based on information fed from the Ship Position and Attitude Measurement System (SPAMS), Timing System, and the Acquisition and Stabilization Network.

After acquisition, during the tracking mode, the ship's Apollo Mission Control Center monitors the spacecraft by the instrumentation status displays, telemetry displays, and flight displays. When command signals are sent to the spacecraft, they go through the Command Control System.

Twelve Systems

The ship's instrumentation complex is made up of 12 systems and a brief description of each of these follows:

Tracking Radar System—The precision C-band tracking radar is an AN/FPS-16 type radar modified for shipboard use. It provides high-accuracy, stabilized tracking of high speed targets at unambiguous ranges up to 32,000 nautical miles using target borne beacons.

Unified S-Band System—The Unified S-band System (USBS) aboard the Apollo Instrumentation Ships provides tracking of a single spacecraft and transmission of voice and data to and from the spacecraft.

Central Data Processing System—Several processing and support functions are performed by the Central Data Processing (CDP) System. To accomplish these tasks, communications between the CDP computer and various other instrumentation systems is essential and is carried out as follows: the CDP computer receives the ship's position and attitude, timing, tracking, flexure, control, and acquisition information; and after processing, outputs data

for control, display, and data transmission. Data are transferred to and from the CDP computer with the various instrumentation systems through the associated interface buffers.

Telemetry System—The telemetry system can receive, store, and process telemetered data. Processed data may be displayed, retransmitted via HF in near real time, or recorded.

Command Control System—The Command Control System (CCS) provides transmission of command data to vehicle and spacecraft. VHF/UHF spacecraft voice communications are also transmitted through antenna elements on the Command Control antenna array.

Timing System—The timing system generates and distributes standard frequencies, time codes and repetition rates for use by shipboard instrumentation.

Ships Position and Attitude Measurement System—This is one of the principal systems of the instrumentation complex. It is comprised of a number of individual subsystems and equipments integrated together to provide data for stabilization of the shipboard antenna systems and for conversion of angle information from deck-referenced coordinates to earth-referenced coordinates.

Acquisition and Stabilization Network—The ASN provides target acquisition and antenna stabilization signals required to interconnect, position, and stabilize the tracking and remotely controlled directional antennas on the ship.

Operations Control Center—The OCC provides centralized control and coordination of all onboard instrumentation systems.

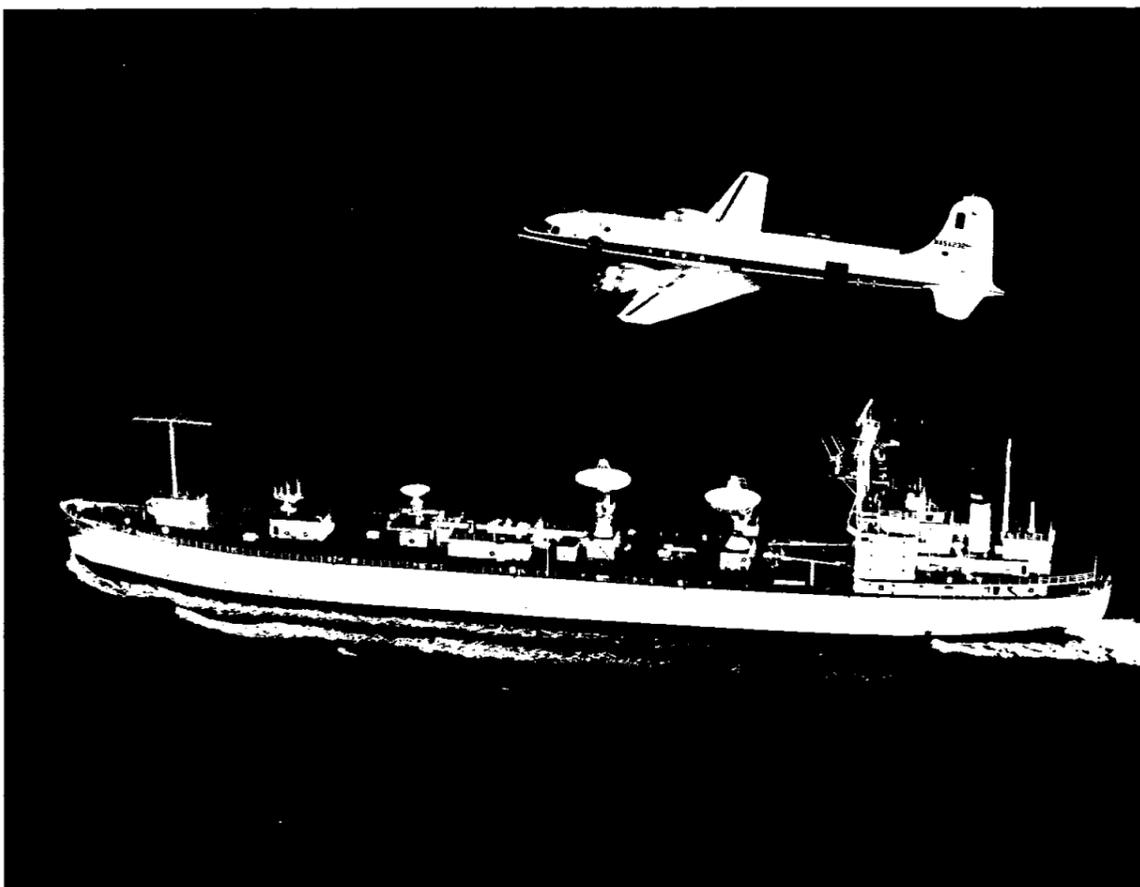
Mission Control Center—The MCC is only on the 19-class ships and is the Centralized Control Facility from which the NASA-MSC flight controllers monitor the shipboard instrumentation status and the Apollo spacecraft data and communicate with the MSFN and the spacecraft.

Satellite Communications Terminal—SATCOM, when it becomes operational will be the primary communications system aboard the 19-Class ships for voice, tracking, and telemetry data to Goddard Space Flight Center and Mission Control Center-Houston.

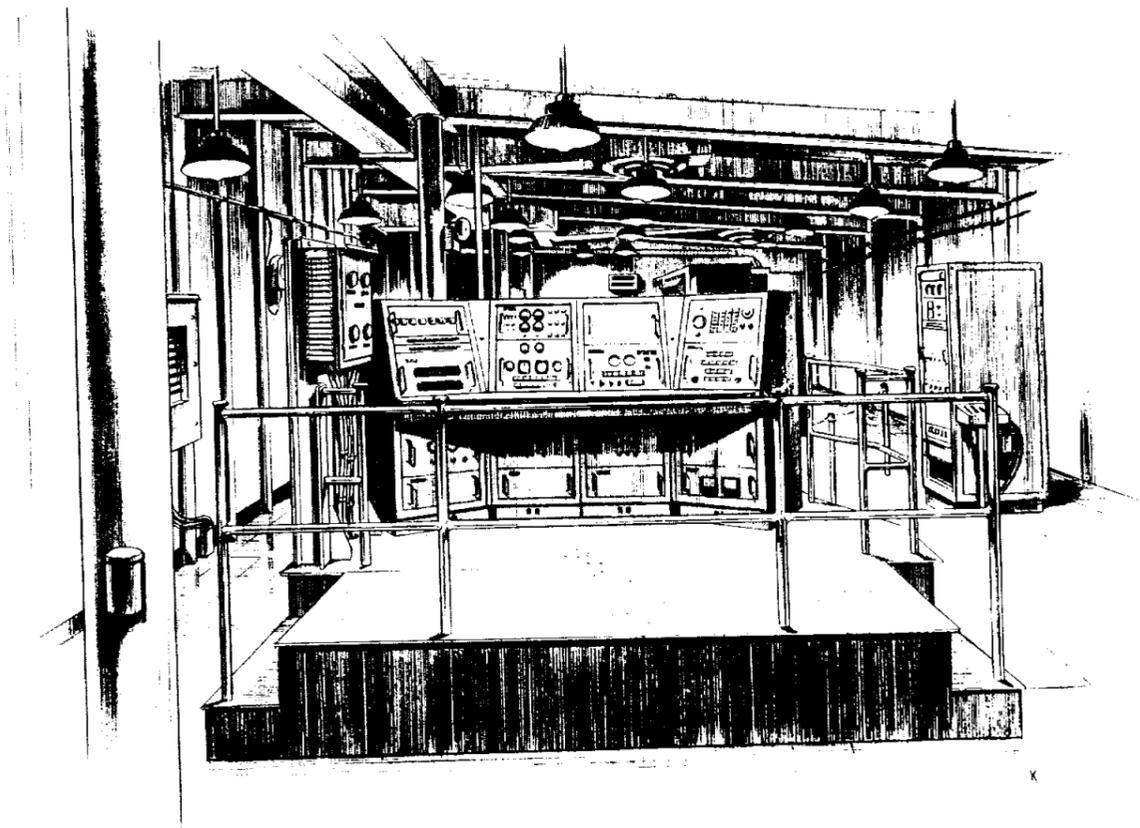
Communication System—Included in the communication subsystem, a dial telephone an instrumentation interphone subsystem, a dial telephone subsystem, and an entertainment subsystem.

Antenna Maze

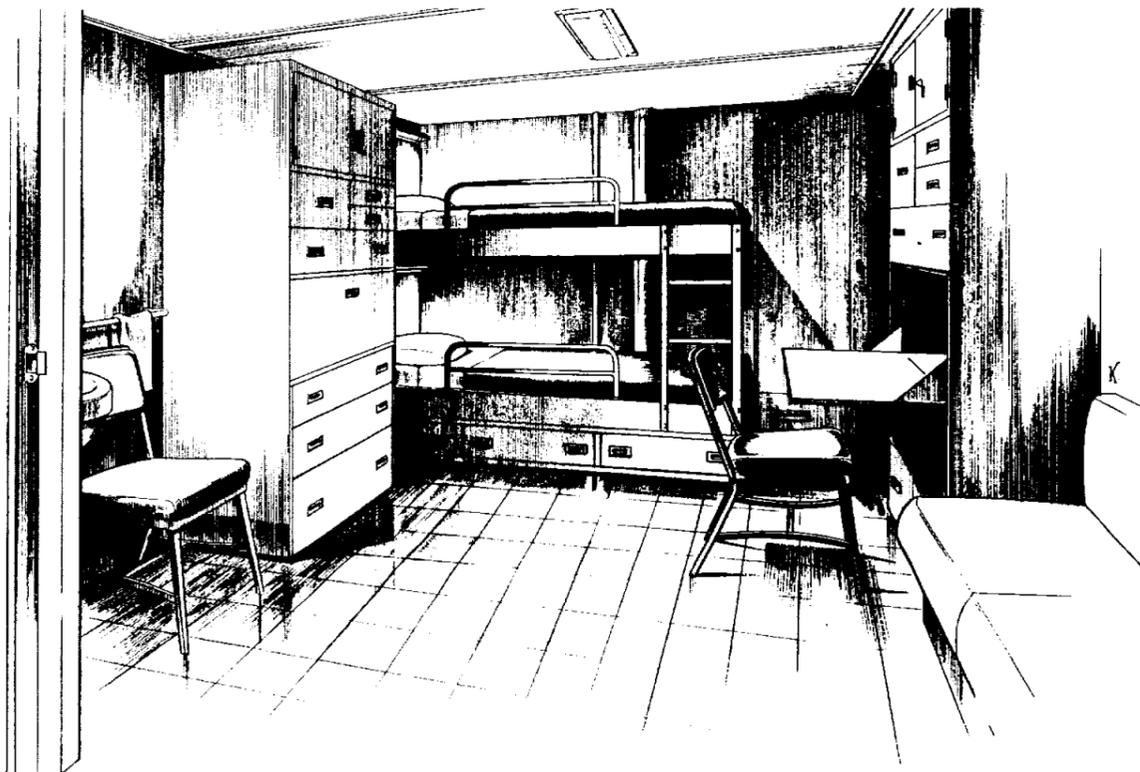
Principal antennas on the ships include 16-foot parabolic reflector radar antennas on the 19-Class ships, and 12-foot point source feed radar antennas on the 6-Class ships. USB antennas on 19-Class ships are 30-foot parabolic reflector, and on 6-Class ships 12-foot parabolic reflector antennas. For the telemetry system, 30-foot parabolic dish autotracking and slaved or manually steered, multi-element antenna are utilized. The type antenna to be used for SATCOM is a 30-foot parabolic.



A NASA C-54 Apollo Range Instrumentation Aircraft overflies the Vanguard during sea trials.



Sketch of a typical tracking ship Unified S-Band Servo Console.



Aboard ship, flight controllers and technicians live in staterooms such as in this sketch.

PAPERWORK LEXICON—

Memorandese Often Needs Translation

Obscure cliches used in offices, both in industry and government, frequently have a hidden meaning and need translating into more basic terms. The following examples are offered as a brief lexicon of stock terms and phrases that are likely to crop up in memoranda, conversations, and on buck slips:

Project—any assignment that can't be completed in one phone call.

Expedite—To compound confusion with commotion.

Efficiency expert—one who is called in at the last moment to share the blame.

Channels—the trail left by an interoffice memo.

Under consideration—"Never heard of it."

Under active consideration—"We're looking in the files for it."

Being transmitted—"It is being sent to you because we're tired of holding the bag."

Activate—to make carbons and add names to the memorandum.

Coordinator—a staff member who talks well and listens well, but has no authority to make a definite statement.

Criterion—a measure which another employee uses to underestimate what you have already overestimated.

Clarification—Filling a background so detailed that the foreground has to go underground.

Modification of policy—a complete reversal which nobody admits.

A survey is being made—"We need more time to think up an answer."

Confidential memorandum—any communication which there wasn't time to mimeograph.

Researching—hunting for the janitor who moved the files.

Note and initial—"Let's spread the responsibility for this."

May we have the benefit of your present thinking—"We'll consider what you have to say as long as it doesn't interfere with what we've already decided to do."

Incentive Program—a scheme to titillate a submerged urge.

Further substantiating data necessary—"Your stuff has been lost; send it again."

It is in the mill—so wrapped up in redtape that the situation is almost hopeless.

Conference—gathering of a group of men who individually can accomplish nothing, and collectively decide that nothing can be accomplished.

Reliable source—the fellow whom you just met.

Informed source—the fellow who told the fellow whom you just met.

Unimpeachable source—the fellow who started the rumor in the first place.

MSC Negotiates Lab Support With B&R-N

NASA will negotiate a contract with Brown & Root-Northrop Corp. of Houston, a joint venture, to provide operational support services to laboratory and test facilities at MSC.

Estimated costs of a one-year cost-plus-award fee type contract to become effective December 1, is \$10 million. The contract will provide for four additional one-year renewals.

Services to be provided under the contract will support operations of the Houston Center's Space Environmental Simulation Laboratory, Crew Systems Laboratory, Experimental Mechanics Laboratory, Lunar Receiving Laboratory, Biomedical Laboratory, and Thermochemical Test area.

The Brown & Root-Northrop Corp. proposal was one of three submitted to the Center.

Junior Co-Ops Hear Life Support Talk

MSC Junior Co-op employees July 17 attended a briefing on space suits and life support systems by Joe Earker of the Extravehicular Equipment Development Branch of Crew Systems Division.

The briefing was held in the auditorium of Bldg 7A.

there is NO VACATION from... COST REDUCTION



The SPACE NEWS ROUNDUP, an official publication of the Manned Spacecraft Center, National Aeronautics and Space Administration, Houston, Texas, is published for MSC personnel by the Public Affairs Office.

Director Dr. Robert R. Gilruth
Public Affairs Officer Paul Haney
Editor Terry White
Staff Photographer A. "Pat" Patnesky

INCREASED WARNING TIME—

Pioneers Inspect Sun's Backside To Gain Solar Flare Cycle Data

The Pioneer VI and VII spacecraft are making the first detailed inspection of the side of the Sun not visible from the earth. Their reports are providing the first regular information on it to the US solar weather forecasting agency.

Observations of the Sun's invisible hemisphere can increase warning time about new or expanding radiation-producing storm areas on the Sun by as much as 13 days. Apollo crews enroute to the moon can use the additional warning to avoid radiation hazards.

The observations also will allow continuous study of the

solar surface as the Sun rotates, helping scientists understand the Sun.

Unlike the moon, which always turns the same face to the earth, the Sun's invisible side becomes visible again every 13.5 days as the Sun turns on its axis once every 27 days.

Both Pioneers are in solar orbits roughly parallel to the orbit of the earth. Pioneer VI is currently almost one third of a solar orbit ahead of, and Pioneer VII a tenth of a solar orbit behind the earth.

The Pioneers observe solar phenomena by measuring particles which arrive at the space-

craft from the surface of the Sun itself.

These observations do not provide as much information on location of solar active regions (storm areas) as do photographs. However, they provide much more information on the physical characteristics of the storms themselves.

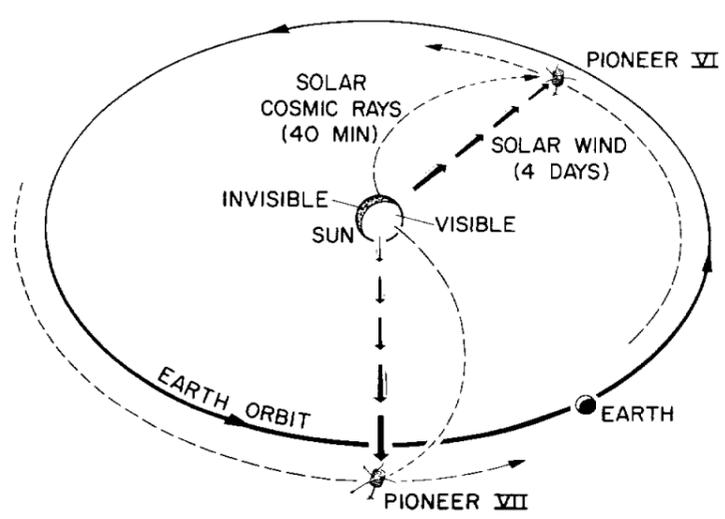
When visual plots of the locations of solar storm areas, made from the earth, are combined with the Pioneer measurements of the same areas as they move around to the solar back side, quite a good picture can be assembled of activity on the side of the Sun away from the earth.

Pioneer data is being furnished daily, when available, to the Environmental Science Service Administration's (ESSA's) Solar Disturbance Forecast Center, Boulder, Colo.

During extreme solar turbulence, Pioneer data is very difficult to unravel for daily reports. Usually, however, Pioneer VI can see "around the corner" of the Sun.

With its two solar cosmic ray and two solar wind experiments, and magnetometer, the spacecraft can sometimes "see" 90 degrees around the Sun ahead of its current position, though longitude of storm areas can be calculated only 45 degrees ahead.

SOLAR WIND AND SOLAR COSMIC RAY MEASUREMENTS BY PIONEERS VI AND VII SPACECRAFT POSITIONS AS OF JULY, 1967



Environmental Health and You

by Dowis C. Atkins

Do you know what to do, who to contact, and how to eliminate a health problem in your work area? Did you know a large group of people are watching out for your health and well-being while you're on the job? They are known as the engineering arm of the occupational health services. Whether you are working for MSC or a contractor, they provide you with services in the major fields of industrial hygiene, sanitary engineering, and related laboratory activities.

What does this mean? The Environmental Health employees recognize, evaluate, and control environmental factors arising in or from the work place to prevent sickness, impairment of health, discomfort, or potentially damaging conditions.

What is the area of Environmental Health?

1. Studies of illumination, ventilation, air pollution, water pollution, noise, toxicology, and nonionizing radiation.
2. Advisory services for facilities where toxic or physical

agents could be potentially hazardous to health.

3. Provide an educational program for all personnel regarding health aspects and practices in the handling of potentially hazardous materials and equipment.
4. Provide environmental health support, as requested, in connection with the development of manned spacecraft and related hardware.

In case of an environmental health problem, involving exposures or hazards that appear to be detrimental to health or life:

What to do? Advise your immediate supervisor.

Who to contact? Your supervisor will report the incident or situation to the Occupational Medicine Branch (5314).

How to eliminate a health problem in your work area?

Follow the directions above, and leave the problem to us.

Spanish Club Elects Officers

The MSC Spanish Club July 11 elected officers for the new club year. Elected to office were President Jose R. Perez, Vice President Steve Gilbreath, Secretary Nancy Shrimplin, Treasurer Harry Kline and Program Chairman Norm Chaffee.

It is anticipated that a course in conversational Spanish will be offered Club members in the near future. Employees interested in the Spanish Club's activities are invited to attend the next meeting on July 25 at 5:15 pm in Room 103A, Bldg 13.

Todos son bienvenidos.



Roundup Swap-Shop

(Deadline for classified ads is the Friday preceding Roundup publication date. Ads received after the deadline will be run in the next following issue. Send ads in writing to Roundup Editor, AP3. Ads will not be repeated unless requested. Use name and home telephone number.)

FOR SALE/RENT-REAL ESTATE

Two adjoining lots, each 50' x 110'. Coney Creek. Small equity, balance \$20/mo. Alma A. Hurlbert, HU 2-1340 after 4:30.

4-bdr, 2-bath in Clear Lake City. Nice yard, all built-ins and drapes. Avail Sept. 1. 6% assumption available. 1923 Reseda Dr. Allen D. Cummings, HU 8-0316.

3-bdr, 2/2 cent. air/heat, living rm, panel family rm, all-electric kitchen, alum scrn porch w/weather panels. Near Seabrook Elementary. Assume \$119/mo. on 5 1/2% loan. In Seabrook, Miramar Addition. Frank Wittler, GR 4-3416.

4-bdr, 2 bath, living rm, dining rm, family rm, carpets, drapes, central air, dishwasher, disposal, 2-car detached garage, swimming pool, water front privilege, fishing pier, boat launch ramp, 100 x 145 lot—Baywood Subdivision, Seabrook. C. J. Hall, after 5 p.m. GR 4-2054.

House, excellent condition, all brick, 3-2-2. Formal living rm plus family rm. Separate dining and breakfast rms. 3 blocks from school. Ample storage, closet, space. Utility rm. 61-25 yr loan. Equity—\$5200. \$163 monthly covers all (taxes and insurance). L. Robinson, MI 9-0857.

3-bdr, ranch style w/detached garage and boathouse. 3 wooded acres on Clear Creek. Friendswood, Fm Rd 528 Price: \$35,000. Roy Darrah at Holloman AFB. Dial 840 and ext. 3760 or 7075.

All brick, 3 bdr, 2 1/2 bath, all-electric kitchen large den w/built-in gun cabinet, desk, and bookshelves; central air heat; carpeted, drapes, intercom, gutters. 6' fence kennels, landscaped—gazebo in back yd, 2-car garage. see to appreciate \$38,500.00. J. Langford, MI 3-7460.

3-bdr; 2-bath, brick home on beautiful wooded lot in El Lago; central air/heat; drapes; fully equipped elec. kitchen; separ-

ate dining rm; 2-car garage. Lewis H. Lee, 877-4297.

House in Clear Lake City, 4-2-2, 1800 sq. ft. \$22,600, open housing seller. Tom H. S. Brown, HU 8-2310.

Unfurnished 2 bdr. house in Bacliff. Fenced-in yard, single garage 1 1/2 blocks from bay and 220 wiring. Doris Hetkes, 534-4228.

FOR SALE—AUTOS

1962 Ford Fairlane, 49,000 miles, green, white, new res, has sticker and plates, runs perfect. \$500. John Bergeron 932-2148.

1966 Chevrolet pickup Fleetside, long wheel base, bed cover, 283 V-8, overloads, heavy duty clutch, tan/white, radio, heater. Tom Howe, HU 6-3269 after 5.

1963 VW, sunroof, 43,000 miles, two new tires, am radio, manual choke, 1/2 (wholesale + retail) or \$722.50 Jeremy Jones, MI 3-1459.

1966 Datsun sta wgn 67 HP., 4-spd trans, radio, clean and in excellent condition. \$1375. J. D. Roberts, Deer Park, GR 9-3929.

64 MGB, radio, heater, tonneau, luggage rack, MG mitton. \$1495. J. C. Whitney, 946-6361 (nights).

1961 Austin Healey-3000. Good tires, body, mechanical, rubber. Radio & Heater. Overdrive \$750.00. W. West, Phone 932-4311.

1966 GTO, Dark Green, factory air, radio, automatic transmission; excellent condition. D. R. Scott, 591-2175, Nassau Bay.

1965 VW sedan, excellent condition, 18,000 miles, original owner, \$1200.00. J. H. Levine, MI 9-2560.

1964 Austin-Healy Roadster w/overdrive; 22,000 miles; \$1,395.00. S. M. Aytan, 877-4001 or GR 4-2760, between 4 and 8 p.m.

1961 Mercury comet, 4-dr, 4 new tires, heater 6 cylinder, automatic shift. Total price: \$575.00. Call Gloria, OV 6-5307 or Mary 582-7304.

1964 VW "Bug" Excellent condition. Reason for sale—want A/C. Tiny Aitken x 591-3695 days. 591-3000 rm 216 Eves.

1963 MK II Austin Healey Sprite. All major components overhauled or replaced less than 1250 miles ago. New lacquer paint, top, tonneau, carpets, tires, side curtains, 30-mo battery and tinted windshield. Eng modified to stage IV tuning and balanced. An essentially new car, rebuilt as a hobby. New project forces sale. \$1195.00. T. M. McPherson, Kemah 877-1630 after 5.

1966 Ford Galaxie 500 convertible, air, cruise-o-matic, power S&B, FM, 390, 12v, 13,000 miles John R. Pierce, HU 8-0354.

1967 Ford Fairlane GTA, fully loaded, burnt amber. W. V. Yeager, GR 7-1354 or GR 3-3825.

1950 GMC pickup, horrible combination of colors, 250,000 miles, but runs good—make offer. Dave Massaro, HU 2-7976.

1940 Pontiac 4-dr. original straight eight. Road lights, turn signals, back-up and courtesy lights, radio, heater, white side walls. Excellent condition. Second owner. See to appreciate at 502 Llano, Pasadena. \$395.00. Dee C. Pollard, 946-3862.

FOR SALE—MISCELLANEOUS

Fender Stratocast guitar, new paint, 3 pickups, tremolo bar; Princeton reverb amp, new condition, has vibrato and reverb pedal, 30-ft cord. Guitar alone \$150; amp alone \$100; both \$225. John Bergeron, 932-2148.

Gas Range, Wedgewood, coppertone, excellent condition, \$60.00. Ken Jones, GR 1-3760.

Six drawer dresser w/mirror \$40, single bed w/box springs \$35. Frank Stafford, HU 6-4942.

Four Goodyear blue streak tires mounted on Corvette wheels \$130.00. Jim Ellis, UN 4-4830.

Fifty H.P. Mercury outboard motor and controls, elec. start, long shaft, 62 model. Good condition, recent major tuneup. \$350.00. Tom Stanley, GR 9-1498.

Male Beagle pup—10 mo. old. Sire: Triple Field Champion mated Dec. Field winner out of a Fld. Ch. Sire. This pup is well bred, good looking and has a 3rd place in a puppy show. Permanent shots. Bargain at \$40.00. Ted Cake, GR 3-8835.

Reel power mower—\$25.00 excellent; work bench—\$5.00; antique kraut board \$45.00; other antiques. J. H. Levine, MI 9-2560.

Golfclubs—Men's Sam Sneed: Wilson Woods 1, 2, 3. Wilson irons 2 thru 8, pitching wedge, and putter and bag. \$40. Women's Mickey Wright: 1 thru 3 woods, 3, 5, 7, 9 irons, putter and bag. Like new. \$60. Phonicille DeVore, Alvin, Tex. after 5 p.m., OL 8-6227.

"Realistic" all transistor AM car radio. Can be mounted in or under the dashboard. \$20.00. Hallicrafters model S-118 five-band superheterodyne receiver. Frequency ranges are 185-KC-420KC, 495KC-1.62MC, 1.6MC-4.95MC, 4.85-15MC and 14.8MC-31MC. Very good condition \$90.00. Steven Nance, GR 2-5108.

Twin size bed w/box spring, mattress, and metal roll-around frame, \$15; Sears chair-drive tricycle, \$5. H. Erickson, MI 9-0396.

RCA Victor stereo, twin cabinet model, all tube circuit in excellent condition. \$150. Nancy Corbett, ext. 5861 (No home phone).

Yellow and white fluffy kittens, male and females. 3 wks old. Rita Hatcher, 482-7642, Friendswood.

Golf clubs: 3 Walter Hagen woods, full set Ben Hagan irons, putter, bag. \$60. Mike Ward, 644-6560.

Male blue point Siamese kittens, 12 wks old, \$13-\$17 Male, seal point, 3/4 Siamese \$10. James Skipper, HU 5-2282.

Double Navy worktank, Aqualung w/ double-hose, excellent condition—cheap. John S. Llewellyn, Alvin, OL 8-4039.

5 hp outboard motor, attached tank, runs, \$40.00. John Miller, GR 1-4390.

1966 Hondo Cub 90, 1500 miles, red/white, buco carrier and rack, available August 25; Bell crash helmet, silver, excellent for cycles or sky-diving. \$50. Elizabeth Wieland, JA 9-7147.

9.15 (820) x 15 tire. Driven only 815 miles, white wall, brand new condition. \$46.00, sell for \$20.00. S. M. Ullman, 877-1694.

18,000-BTU G.E. air conditioner. Age unknown and doesn't work—make offer. Dave Massaro, HU 2-7976.

New Scorpion fiberglass sailboat. Length 13' 9", 75-sq ft sail area. Nassau Bay, Bob Ward, 591,2182.

WANTED

Sailboat—Sailfish, Sunfish, or Dolphin. Tom Gundoson, GR 1-2320 or GR 4-3338.

Girls' 20" bicycle, good condition. Bob Wolf, 932-2064.

Ride needed from North side area to MSC Bldg. 8, Aug. 7-11, 7:30-4:00. Cheryl Martin HI 2-5327 or Ext. 3136.

Will trade 26" girl's bike in good condition for smaller bike. C. Hooper, Ext. 5127 (No home phone).

Ride wanted from Birdsell & Memorial or will meet downtown, Austin at Hadley. Hours 8:30 to 5:00, Bldg. 2. Bill Drastata, UN 4-0553 after 6:00.

Need competent person to care for infant child during weekdays in own home. Must live in Clear Lake area and references required. Clark Neily, 932-2993.

Person who dented right rear door of 66 silver Impala July 12 parked in Bldg 2 parking lot please call, if have liability insurance. M. Rust, Ext 3044.

Carpool from Westbury area to Center 8-4:30. C. Vetter PA 3-0928 or Ext. 3726.

To Rent, September: 3-bdr home or apt., near MSC. S. M. Ullman, 877-1694.

LOST

Eye glasses w/brn frames somewhere across park from Clear Lake Country Club night of July 4th. If found contact Don Freeburn, Bldg. 16, ext. 4671 or home phone after 5:00 p.m. at MI 3-9341.

Lady's wristwatch w/black band and inscription on back, somewhere in Nassau Bay or Clear Lake City. C. Hooper, Ext. 5127 (No home phone).



PIT STOP—Five-year old Will Brown prepares for a practice run with his quarter midget racer as Mark Armstrong, 4, left, and Rickey Armstrong, 10, make sure that his equipment and racer are ready. Will is the son of Bob Brown of Bell Aerosystems, and Mark and Rickey are the sons of MSC pilot Neil Armstrong.

Racecar Group Forms For Little Indy Drivers

MSC and contractor employees who have pint-size laps in the actual race varies, depending upon whether the race is the main, semi or consolation event, and all starts are of the rolling inverted type with fastest qualifying cars in the rear.

Not only does quarter midget racing help develop closer parent-child relationships, but it develops in the child alertness and coordination which will be of value to them throughout their lives. Other traits fostered by the activity include generating the ideas of fairness, generosity, sportsmanship and the sense of responsibility without envy of others.

Employees where offspring are the competitive type and who like auto racing should call Bob Brown at 591-3100 for additional information and to express interest in getting a Quarter Midget chapter rolling in the MSC area.

The quartet midget racer is a scaled-down Indianapolis car with a maximum 52-inch wheelbase and a two-horsepower direct-drive gasoline engine. Drivers, ranging in age from five to 15, are adequately protected

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by such safety devices as seat belts, crash helmets and roll bars.

At the present time, there is not a quarter midget track in the Houston area. Parents of local small-fry race drivers have to trailer the cars to San Antonio or Dallas where active Quarter Midget chapters have developed tracks and facilities for competition.

The Quarter Midget Association has stringent rules governing the construction of racers bodies and modifications to engines to insure that all drivers have an even break and that no racer has an unfair advantage of being "hopped up."

In competition, drivers must make pre-race qualifying runs just as their big Indianapolis brothers make. The number of

Robbins Speaks To Astronomers

The MSC Astronomical Society July 24 will holds its monthly meeting in the MSC News Center, Nassau Bay Bldg 6, at 7:30 pm.

Donald Robbins, head of the solar physics section of the Space Physics Division, will be the featured speaker and will discuss various types of solar phenomena and how the Solar Particle Alert Network (SPAN) station at MSC is used in predicting solar activity. He will illustrate his talk with a film showing the development of a solar flare.

Other Society projects include a class in mirror grinding being organized by Vice President-Technical Projects Saulietis. To enroll in the class, call Sauleitis at 3566.

The Society's next public observation night will be on August 14 when the moon will occult the 3.1-magnitude star Sigma Scorpii at about 10:54. The observing site will be in Shoreacres Park on Oakdale Street in Shoreacres.

Co-op of Month



PROFICIENT—Oklahoma State University aerospace engineering major Charles Allton, when at MSC in the work cycle of his co-op plan, is assigned to the Engineering Division where his supervisors have found him "most productive and unusually effective in detail design, design layout, and preparation of engineering drawings of experimental test equipment . . . attaining a proficiency usually found only in graduate engineers with much more experience."

Slow-pitch Soft Ball League

Standings as of July 14

American Division			National Division		
TEAM	WON	LOST	TEAM	WON	LOST
Animals	6	0	Packers	6	0
Mets	6	1	TSD	6	1
Apollos	6	2	FSD (Supporters)	6	1
Charlie Brown			LRD-Gold	5	3
All-Stars	5	2	Marauders (Becker)	4	3
Procurement & Contracts	4	4	Lunartics	3	4
CAD	4	4	SMD	3	5
RMD	3	4	LRD-Blue	3	5
GRPB	2	4	Rats	2	4
Hustlers	2	4	Old Timers	2	5
SEAD Comets	2	6	MPAD-G&PB	2	5
CSB	1	5	Coast Guard	1	7
Beepees	1	6			

Computer Group Forms Education-PR Committee

The MSC Chapter of ACM (Association for Computing Machinery) has recently formed an Education and Public Relations committee headed by John Mazor and Ned Reinhold, both of LEC. The initial thrust of the fledging committee's efforts will be directed towards area high schools in the form of aids to be used by teachers when individual classes would benefit from computer utilization information.

MSC employees serving on this committee are George Roush and Linda Reynolds.

The committee's plans for implementation include:

1. Assemble a bibliography of elementary texts, filmstrips and movies available through loan from MSC and/or contractor companies.

2. Enlist the support of technical personnel in the NASA area who would be willing to explain their function and knowledge in the computing field to high school classes on an occasional basis by teacher's invitation.

3. Catalog the information in areas (1) and (2) and prepare listings of available resources by high school course categories and

4. Present the above to all teachers in Clear Creek High School and encourage its use.

The anticipated results will be individual teachers calling on ACM to assist with classroom instruction (materials, speakers, or both) when the class would benefit from knowledge of the data processing field. The Education and Public Relations Committee will act as a clearing agent for requests and schedules and attempt to keep the list of resources up to date.

Your support is vital to the success of this project. If you know of any materials that are available or are willing to share insights into your profession, please let it be known. Contact any committee member officer of ACM John Mazor Ext 5471, or Ned Reinhold HU 8-0080, Ext. 415.



Forty Grad Students Join MSC's Aerospace Summer Intern Program

Forty outstanding graduate students joined MSC June 12 in the Aerospace Summer Intern Program. The Program, in its fifth year at MSC, includes

the US Air Force Academy and the US Naval Academy among the 29 colleges and universities represented.

Technical Interns in the group are:

Lloyd L. Bonzon, University of Illinois; Otis B. Brown, University of Miami; Kenneth R. Bruno, Columbia U.; James P. Cerne, Case Institute of Technology; R. O. Covey, USAF Academy; Kenneth J. Deprez, University of Wisconsin; Paul M. Doane, Purdue University; Clyde W. Hensley III, University of Texas; G. J. Hoerter, USAF Academy; Thomas G. Horn, Arizona State University; C. A. Janisen, USAF Academy; Edwin A. Jerome, Notre Dame; William B. Johnson, Jr., OSU; Kevin A. Kelly, Notre Dame; George G. Klee, Syracuse University; Donald Q. Lamb, Jr., Rice; Frederick K. Lamb, California Institute of Technology; Miles A. Libbey, US Naval Academy; Terry D. Mathis, OSU; James L. May, University of Houston; Ralph A. Nelson, Jr., North Carolina State University; Dennis L. Nervig, Iowa State University; Leo J. Peters III, Lamar State; D. M. Phillips, USAF Academy; Jerry E. Rothrock, Rice; P. M. Schmidt, USAF Academy; Thomas V. Shockley III, Texas A and I; Kurt H. P. H. Sinz, Texas A and M; and Maurice C. Todd, North Carolina State University.

Administrative Interns are: Frederick Charap, New York University; Wilbur R. Clark, University of Alabama; Hubert L. Evans, Atlanta University; Richard W. Griffin, Lamar State; Peter H. Koehn, University of Colorado; Richard S. Morelli, Syracuse University; Rosemary N. Nance, OSU; John S. Noyes, OSU; William C. Pierotti, University of Southern California; David F. Webb, University of Texas, and Norman G. Werbner, U. of Houston.

The Program provides graduate students the opportunity to integrate experience in their field of interest with academic study. In addition to planned work assignments, the interns will attend seminars describing various MSC activities. Students should leave the Center at the end of the summer with considerable insight into the challenges of the manned spaceflight program. Augmenting the knowledge gained by the interns for their own benefit, it is hoped they will relay information to their respective schools regarding their summer activities and the manned spaceflight program.

Participants in the Summer Intern Program are carefully selected and recommended by college and university deans and department heads. In addition to having excellent academic grades and a recommendation by a college official, each intern must have the specific interest and background that will fit well with a particular MSC function.

The Program provides internships in the science and engineering disciplines and in public and business administration. Students entering the Program participate in an extensive seminar program in engineering design and operation of manned spacecraft, while administrative majors attend graduate level seminars covering major administrative and management functions.

All interns will work under the direction of senior MSC staff. Fourteen academic majors are represented including astronautics, engineering, physics, mathematics, and public and business administration. Academic progress ranges from June graduates to one intern very near completion of his PhD.

Women played an important role in the construction of the first Vought VE-7 airplanes sold to the Department of the Army. Assembly involved little more than a skilled seamstress, a supply of needles, cloth and glue, and the labor of love.



MARCH 17, 1917

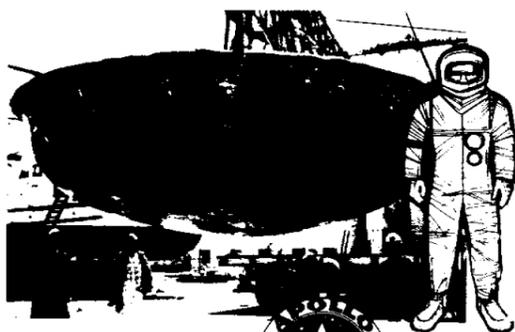
Material forming underwent dramatic changes during the development of the airplane. Lightweight metals replaced fabric, and welding, riveting, and machining techniques were developed.

Today's Apollo employs far more advanced manufacturing methods. Explosives are used to form certain large structures.

Electromagnetic, pneumatic, and electrohydraulic processes have been developed to produce the tolerances, shapes, and joints required for space vehicles.

One element never changes: It takes good men and women to make things that work.

This is the year of Apollo; the year when excellence, in everything we do, really counts.



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